Remarks

In response to the Office Action mailed November 26, 2008, Applicants file this Amendment and Reply. Claims 1-40 are pending. Claims 2-16 and 18-40 are amended. No new matter is presented as support exists throughout the application as filed. Certain claim amendments are made to better align the claims in accordance with U.S. practice.

Claim Rejections – 35 USC §112, First Paragraph (1)

Claim 38 stands rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants hereby amend the claim to create proper basis for the claim's recitations. Applicants request withdrawal of the rejection.

Claim Rejections – 35 USC §103

Claims 1-3, 5, 12-25, 28, 29, 30, and 40 stand rejected under 35 USC §103(a) as being unpatentable over Barnes (US 6,448,907), in view of Abeles (US 5,846,641).

Claims 4, 6, 7, 8, 9, 10, 11, 31, and 36 stand rejected under 35 USC §103(a) as obvious over Barnes in view of Abeles and further in view of Carolan.

Claims 26 and 27 stand rejected under 35 USC §103(a) as obvious over Barnes and Abeles and further in view of Roberts and Galloway.

Claims 32, 33, 34, 37, 38, and 39 stand rejected under 35 USC §103(a) as obvious over Barnes in view of Abeles and further in view of Oki and Moon.

Applicants request reconsideration of the rejection.

The USPTO bears the initial burden of factually supporting a *prima facie* conclusion of obviousness. As restated in MPEP §2143.03, all claim limitations must be considered. Further, as noted in MPEP §2142.02, the claimed invention as a whole

must be considered. In this case, the Examiner fails to establish *prima facie* obviousness since several claimed elements were not considered in the obviousness argument.

As noted at paragraph [0082] of the present application, the present invention relates to the production of synthesis gas and, in particular, the conversion of methane to syngas which requires a partial oxidation of methane and oxygen to carbon monoxide and hydrogen. The gases are kept separate with a **separate supply** for both the oxygen and methane supply before contact with the catalyst and the membrane. This arrangement provides technical advantages which are neither taught nor suggested in the prior art. For example, paragraph [0019] of the present specification references the fact that the energy imparted on the first reactant activates molecules of the first reactant **without** forming an ionic species, such as O^{2-}.

This is in direct contrast to the cited references.

Paragraph [0086] of the present specification describes the situation where oxygen molecules come into contact with the catalyst which activates the oxygen and methane **before** contacting the methane present in the inner bore of the modified membrane. Again, the cited references neither describe nor suggest this claimed feature.

Still further, paragraph [0088] of the present specification describes a **natural pressure differential** that allows the produced syngas to exit the membrane under pneumatic control. Due to the porous nature of the set-up, both low and high flow rates may be used without impacting adversely on the syngas quality, see paragraph [0104] of the present specification.

Gases such as oxygen and methane can be **fed separately** into the apparatus. This prevents any danger of explosion and is a significant advantage over the prior art which relates to mixing gases, as will be discussed below. Particular reference is hereby

made to paragraph [0130] of the present specification, where the separate feeding of the gases is described in more detail.

Still further, paragraph [0131] of the present specification describes a highly dispersed catalyst which increases the surface area and efficacy of the apparatus.

Moreover, as described in paragraph [0134] of the present specification, a highly dispersed catalyst allows for lower reaction temperatures and therefore reduces the propensity for coke formation and subsequent deactivation of the catalysts. The present invention also provides for a fast start-up as described in paragraph [0137] of the present specification.

The cited references fail to teach, describe, or suggest all of the claimed elements of the present invention. To the contrast of the present invention, Barnes relates to **a reactant gas mixture**. For example, claim 1 of Barnes relates to a reactant gas mixture. The whole of the Barnes reference is devoted to gas mixtures, with one example including such as column 4, lines 48 to 67. The method described in Barnes is therefore highly susceptible to gas explosions. This is in complete contrast to the present invention wherein the gases are fed separately to the apparatus. The method described in Barnes therefore relates to a mass transfer reaction which bears no relevance to the method described in the present invention. Barnes not only fails to describe the elements of the claimed invention but, in fact, teaches away from the invention. As noted, the Barnes reference exclusively describes gas mixtures. Barnes emphasizes the advantages of such mixtures and, therefore, discourages those of ordinary skill away from the present invention.

The Examiner combines the primary reference, Barnes, with a secondary reference, in an attempt to reach all of the claimed limitations. Abeles, though, fails to support a *prima facie* argument. Abeles once again relates to a quite different invention. Abeles cannot contribute to the *prima facie* case.

As shown in Figure 2 of Abeles, there are **two catalyst beds** separated by a **dense ionic transfer medium** (i.e. a non-porous membrane). The oxygen flow through this membrane will be low which is in contrast to the present invention which allows a high flow-through. Moreover, due to the **dense** membrane, there would be no space to actually locate the catalyst in the membrane. Abeles therefore clearly teaches away from incorporating the catalyst into the membrane. The Abeles use of a **dense** ionic transfer medium teaches away from the present invention, which relates to the provision of a porous catalyst with the introduction of gases fed separately which are then allowed to mix.

Barnes fails as a primary reference. Further, even on the combination of Barnes and Abeles, the skilled person would still not arrive at the present invention as defined in the present claims. There is no description, teaching, suggestion, or motivation for a person skilled in the art to arrive at apparatus which has separate feeds for the different gases and the provision of a porous membrane which allows the passage of a first reactant from a first chamber into a second chamber through a membrane wherein the gases may then react.

Since the independent claims are not obvious, the claims depending therefrom are likewise not obvious. Applicants refer to MPEP §2143.03. Thus, Applicants need not address the specific contentions concerning the dependent claims and the remaining cited references, Carolan, Roberts, Galloway, Oki, and Moon.

Applicants request withdrawal of each of the §103 rejections.

Applicants believe the proposed claims are in condition for allowance and such action respectfully is requested. If the Examiner has any matter outstanding for resolution, he is encouraged to telephone the undersigned for expeditious handling.

Respectfully submitted,

Date: 26 Feb 2009

Amy H. Fix
Reg. No. 42616

WOMBLE CARLYLE SANDRIDGE & RICE
P. O. Box 7037
Atlanta, Georgia 30357-0037
(919) 484-2314 (direct dial)
(919) 484-2071 (direct facsimile)